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ABSTRACT

This study of the relation of variables of home environment to differences in children's cognitive development used a sample of 25 pairs of grade five boys in the 10-12 age range matched for general intelligence but discrepant with respect to verbal ability. Home environmental measures were obtained by means of a 70 minute interview with the mother. Differences between means for the high verbal boys as compared with low verbal boys revealed that high verbal boys were from homes where parents have a higher interaction index, higher academic and vocational aspirations, provided more opportunities for the use and development of language, and higher occupational status. The variable "opportunities for the use and development of language" was the best predictor of verbal ability for the pooled sample. Inclusion of the occupational level of parents as a second predictor significantly increased predictability of verbal scores. Findings of the study are considered to contribute to understanding the interactive process between environment and heredity, and enhance the ability to maximize the environmental influence for the improvement of deficit skills. [Not available in hard copy due to marginal legibility of original document.] (Author/JM)

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HOME ENVIRONMENT AND THE DEVELOPMENT OF VERBAL ABILITY

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HOME ENVIRONMENT AND THE DEVELOPMENT OF VERBAL ABILITY

ABSTRACT

It was the purpose of this study to examine variables of the home environment in relation to differences in children's cognitive development. Two groups, of equal general intelligence, but having discrepant verbal ability were examined. The sample consisted of 25 pairs of grade 5 boys in the 10-12 age range. Each pair was matched for general intelligence but discrepant with respect to verbal ability. Home environmental measures were obtained by means of a 70 minute interview with the mother. The schedule consisted of 25 questions which were modified by Mosychuk from Wolf's 3 environmental process variables, and also included 3 closed schedules developed by Bernstein to assess the mother's interaction index. Differences between means for the high verbal boys as compared with low verbal boys were tested for significance by the t technique for means from correlated samples. High verbal boys were found to be from homes where parents have (1) a higher interaction index (2) higher academic and vocational aspirations (3) provided more opportunities for the use and development of language and (4) higher occupational status. A stepwise regression procedure was applied to determine the contribution made by each variable to the variance in verbal ability scores. The variable "opportunities for the use and development of language" was the best predictor of verbal ability for the pooled sample and accounted for 51 percent of the variance. Inclusion of the occupational level of parents as a second predictor significantly increased predictability of verbal scores to the 59 percent level. Findings of the study contribute to our understanding of the interactive process between environment and heredity and enhance our ability to maximize the environmental influence for the improvement of deficit skills.

During the last decade considerable attention has been drawn to the urgent need for exploring the environmental antecedents of intelligence. While social and cultural conditions are undeniably important, a great deal more research is required to determine the relative potency of different environmental characteristics on the development of different aspects of human intelligence.

Intellectual abilities may be conceived as if usually correlated in a hierarchical model. At the top of the hierarchy is general intellectual ability, similar to Spearman's "g", but "psychologically the all-round level of our thinking skills". Further down in the hierarchy are group factors, among which verbal and spatial abilities are predominant. Relative to the exploration of environmental influences in the context of differential cognitive development, Vernon (1965) has suggested the usefulness of working within the framework of such a hierarchical model. It was the purpose of this study to examine variables of the home environment in relation to differences in children's cognitive development. Two groups, of equal general intelligence, but having discrepant verbal ability, were examined.

The dearth of adequate measures of the environment has in part been responsible for the slow progress in isolating the environmental antecedents of intelligence. The traditional approach to the measurement and analysis of the environment has usually been limited to crude and indirect indices, such as socio-economic level and occupational and educational levels of parents. While these have been shown to relate to intelligence, the literature about what kinds of tests and items are most sensitive or insensitive to socio-economic differences is not very consistent (Butcher, 1968, p. 262). Eells assembled this evidence and, while admitting some inconsistency in the findings, concluded that in general, "items which were mainly linguistic or scholastic favoured children from high socio-economic backgrounds...". However, the major finding of a study by Vernon (1965) of West Indian children was that "children whose mental development is handicapped by poor socio-economic, cultural and linguistic environment...., show this to a greater extent in practical-spatial and some abstract non-verbal abilities...".

In any event, the explanatory force of gross socio-economic types of characteristics is clearly weak. A general intervening variable is required if any light is to be thrown on the mechanics by which social background is translated into intelligence. A couple of promising attempts to develop more precise and specific environmental measures have recently been made. Bernstein sees the family's speech model as the dynamic between social status and intelligence and has provided a measure of the mother's disposition towards encouraging the child to interact with his home environment on a verbal-cognitive level (Bernstein & Young, 1966). Wolf (1963) hypothesized three process variables (press for achievement motivation, press for language development, and provision for general learning) to describe the interactions between parents and children in so far as intelligence development is concerned. He found that the correlation between the total Environmental Rating and IQ scores was +.69. It would seem that Wolf's approach to the measurement of environment accounts for about three times as much of the variance in IQ as a measure of social status does. Additionally, he found a considerable amount of variability within each social class group. Factor analysis of these environmental process variables revealed a single general factor and the total environmental rating was related to overall intelligence. Mosychuk

(1969) attempted a modification of Wolf's scales with the aim of measuring the home environment differentially and predicted differential effects of such variables on different abilities. Accordingly, three scales (academic and vocational aspirations of parents: knowledge of child's academic and intellectual development: material and organizational opportunities for the use and development of language) were hypothesized to relate more highly to verbal ability. Mosychuk found that while they did relate moderately to WISC verbal scales, they also had an equally high relationship with certain performance scales.

These two conceptualizations of the dynamic aspects of the home educational environment provided a framework from which the following predictions were made:

A. Subjects possessing high verbal ability in comparison with subjects, of equal general intelligence, but of low verbal ability should be from homes where parents have:
   1. a disposition towards encouraging the child to interact with his home environment on a verbal-cognitive level, as against an orientation towards evasion or constraint
   2. higher academic and vocational aspirations and expectations for the child
   3. greater knowledge of, and interest in the child's academic and intellectual development
   4. provided more material and organizational opportunities for the use and development of language.

B. It was further maintained that if these four variables favour disproportionately the development of verbal ability, as theoretically maintained, this specificity could be further demonstrated by showing that other types of abilities do not differ across the boys having discrepant verbal ability. This prediction was examined with respect to spatial ability, assessed by the WISC Block Design Test.

Additionally, the two groups were examined for differences in occupational level of parents, using Blishen's Index for occupations in Canada (1967).

Methods and Procedures

Subjects

The subjects of the sample were grade five boys (in the 10-12 year age range) from the St. John's Roman Catholic school system. (The study was confined to boys because, as other researchers have pointed out, the long-term effects of upbringing are more clear-cut than in girls.) During the first stage of sample selection, all the boys of six grade five classrooms from five elementary schools were administered Raven's Progressive Matrices Test. This test has repeatedly proven its worth as a measure of the general intellectual factor (g), in vastly different cultures (Biesheuvel, 1969, p. 78). Boys having an IQ (given by the Progressive Matrices) within the 90-130 range were given a measure of verbal ability. This consisted of the following three subscales from the WISC: Information,

Comprehension, and Vocabulary. Factor analytic studies of the WISC indicate that these three scales form a verbal cluster which has been labelled a verbal-comprehension factor (Goodenough & Karp, 1961). From these 139 boys, 29 pairs were selected. Each pair was matched for general intelligence (to within one IQ point) but discrepant with respect to verbal ability. The boy classified as low verbal had a mean scaled score (across the three WISC subscales) which was at least three units below that of the boy classified as high verbal. The final sample consisted of 25 pairs, four having been eliminated because the mother of one member of the pair could not be contacted (two mothers refused to cooperate in the study and two were in hospital with a terminal illness). Table 1 contains statistics descriptive of the sample.

Measurement of environmental variables

The home environmental measures were obtained by means of a 70-minute interview with the mother*. The schedule consisted of 25 questions, each having two or more sub-items. These questions were taken directly from the schedule developed by Mosychuk, which is a modification of Wolf's three environmental process variables. The first scale consisted of five questions relating to the "academic and vocational aspirations and expectations of parents". The second scale, "knowledge of, and interest in the child's academic and intellectual development", was assessed by six questions; and the remaining 14 questions were devoted to the scale, "Material and organizational opportunities for the use and development of language". During the interview mothers also completed three closed schedules by ticking or marking a range of items. These closed schedules were developed by Bernstein to assess the mother's interaction index. One schedule gave an 'Avoidance Index', measuring the mother's disposition to answer, or avoid answering, difficult questions from the child. The second schedule gave a 'Chatter index', measuring the mother's disposition to continue a verbal interaction initiated by the child. From the replies on both of these schedules the 'communication component' of the interaction index was constructed. The third schedule dealt with the mother's views on the use of toys. The mother had to mark six possible functions of the uses of toys in order of importance. It was determined (Brandis, 1966) that the indices contribute to one general factor, justifying a General Interaction Index where a high score indicates a disposition to encourage the child to interact with his home environment on a verbal-cognitive level.

From the interview, four variables were obtained. Differences between the means of these variables for the high verbal boys as compared with low verbal boys were tested for significance by the t technique for means from correlated samples. As stated, the Interaction Index was composed of two components; these were treated separately and in composite, thus giving a total of six comparisons. One-tail t tests were used as the direction of the differences was predicted in all comparisons.

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*The mothers were interviewed by a graduate student (Mrs. M. Dunn), who also coded the responses. Marcia did not know specifics of the study, nor to which group the mothers belonged.

Results

Table 2 presents the obtained values of t and indicates their significance. Mothers of high verbal boys have a higher interaction index than do mothers of low verbal boys ($p < .05$), indicating that they are more disposed towards encouraging the child to interact with his home environment on a verbal-cognitive level. Viewing the components of this index, it is clear that the difference is attributable more to the mother's view on the use of toys. Mothers of high verbal boys view toys as serving a cognitive child-oriented function as opposed to an instrumental mother-oriented function. While there was a tendency for the same mothers to encourage verbal interaction by answering their children's questions and continuing to chat with them, this orientation was not significantly different from that of mothers of sons having low verbal ability.

Within group comparisons revealed that the communication index, and especially the chatter component, are significantly related to verbal ability within the low verbal group ($r = .44$ and $.53$ respectively) but within the high verbal group neither relates to verbal ability ($r = .09$ and $.11$). While this observation does not address itself directly to the hypothesis under investigation, it does suggest the need for further examination of the relevance of verbal interaction. These correlations (viewed in relation to the size and homogeneity of the sample) might be taken to suggest that the verbal interaction level has to be extremely low before it results in lowered verbal ability. The ability of the scale to discriminate within the higher levels of interaction should also be determined.

The finding with the General Interaction Index is similar to Bernstein's finding of a positive relationship between the index and vocabulary scores. He has not reported separate correlations for the toys and communication components with respect to vocabulary, but he has indicated that the Toys Index is more highly related to the WISC performance than the verbal scale. This appears to be inconsistent with results of the present study. As will be discussed later, the two groups of boys in this study do not differ on the Block Design. Thus the Toys Index difference relates to a verbal discrepancy which is not accompanied by a spatial factor difference. Pertinent to these findings are two suggestions of how toys are instrumental in the development of intelligence.

Several researchers have hypothesized that the number and variety of toys available for experimentation would more highly relate to spatial ability than to verbal ability. However, neither Bing (1963) nor Mosychuk (1969) were able to substantiate this hypothesis. Bernstein (1967) has suggested that the significance of a toy depends more on the mother's interpretation of the toy to the child than on any intrinsic property of the toy. The mother's interpretation is, he suggests, a reflection of the general guidance and control procedures that she employs in her dealings with the child. In other words, he is suggesting that the content may be less important than the way the content is represented to the child. Thus he sees the Toys Index and Communication Index as reflecting this general orientation on the part of the mother. It is interesting that the first explanation regarding the intellectual value of toys appears more consistent with Bernstein's finding, whereas his explanation seems more congruent with findings of this study. Further research is needed to sort out the functions which toys play in the

development of abilities. Content or properties of the object, and way of presenting the content may both be important, perhaps differentially, in the development of intellectual skills.

The home educational environment of the high verbal boys was found to differ significantly from that of the low verbal boys with respect to two of the three process variables measured. Mothers of high verbal boys reported a higher level of expectations and aspirations for their children in the areas of present and future academic studies, and a future career. They also made more deliberate and constant efforts to provide opportunities for the use and development of language and vocabulary. They did not, however, differ with respect to their knowledge of their children's academic progress. Both groups of mothers reported having equal knowledge of how their children were doing in school and reportedly had equally frequent contact with school personnel. The assumption that having information about the child's school life (e.g. who his teachers are, what subjects he is doing poorly or well in) is a positive attribute especially for the development of verbal ability would seem not to be justified. It might well be that the more important questions are, how this knowledge is acquired and what use is made of it. (It was suggested, e.g., that mothers in this particular school system, must meet the teacher because it is required by the school as a means of getting report cards to the parents. Similarly, having contact with the school might reflect the home's inadequacy to provide a positive learning environment.) While findings with respect to this scale suggest that the mothers do not differ quantitively regarding their interest in their children, findings with respect to the other process variables strongly suggest that they do differ in the extent to which they invest this interest in providing opportunities for the development of language.

While the present study was concerned with dynamic factors of the home environment, with what parents do, rather than what they are, the two groups were examined for differences in occupational status. It was found that boys of low verbal ability were from homes having a significantly lower occupational level. This finding supports others in suggesting that low occupational status is often accompanied by a verbal or linguistic deficit. The value of this study lies in indicating more specific ways in which the home environment of low and high verbal subjects differ. The identification of such behaviorally-defined characteristics contributes more directly to our understanding of the interactive process between environment and heredity and enhances our ability to maximize the environmental influence.

An additional purpose of the study was to examine spatial ability across the two groups of boys. The mean Block Design score for the low verbal boys was 8.9 as compared with 9.5 for the high verbal boys ($t = 0.82$, $p > .10$). This finding, of a non-significant difference in spatial ability for high verbal as compared with low verbal boys increases our understanding of the relative potency of the environmental factors found to differ across these two groups. Differences in mother's orientation to the child's home-based interaction, coupled with differences in the parents' level of aspirations and their provision for the development of language appear to have greater significance for the development of verbal ability than for either general or spatial ability.

In addition to the univariate comparisons of the mean scores just reported, multivariate comparisons were subsequently carried out. While there is no attempt to suggest that the low- and high-verbal groups previously described represent a simple random sample from any definable population, the boys were pooled for the purpose of the analysis that is to follow. Starting with the matrix of inter correlations of all the environmental variables, a stepwise regression procedure was applied to determine the contribution made by each variable to the variance in verbal ability scores (Draper & Smith, 1966). This procedure identified the variable "material and organizational opportunities for the use and development of language" as the best predictor of verbal ability. It accounted for fifty-one percent of the variance, a contribution significant beyond the .001 level. The occupational level of parents was found to further contribute significantly ($p < .01$) to the prediction of verbal ability and its addition as a predictor increased the percent of variance accounted for to fifty-nine percent. The two other process variables of Mosychuk further increased predictability to the sixty-one percent level (for "knowledge of child's academic and intellectual development", $p = .07$) and to the sixty-two percent level (for academic and vocational aspirations of parents, $p = .17$). Neither component of the Interaction Index contributed significantly to the prediction, when allowance was made for the above variables already in prediction.

Implications of Results

This study clearly showed the influence of factors in the home environment on the verbal abilities of boys in the 10-12 age range. With such specific knowledge of the influence of environmental factors, it should be possible to program stimulation so as to vitiate the effects of unfavorable environments.

Findings of the study can have a number of applications both in and out of school. A possible area of application of these results is the education of parents. It is quite plausible that parents can modify such factors as level of aspiration and provision of opportunities for the development of language if they so desire and if they acquire special techniques for doing so. Parents need to become more aware of the value of specific practices for strengthening the intellectual climate of the home. The need is more prevalent among lower-income homes not simply because such practices are more often lacking but because certain deficit skills, such as lowered verbal facility, may often, quite wrongly, be equated with lack of intellectual potential, leading to an attitude of defeat and lowered expectations for academic development. The school should serve as a resource centre for making intellectual activities available to lower-income homes. Parents, together with children, should be encouraged to come and watch televised educational programs, borrow books, engage in activities where parent and child can learn ways of interacting at an improved verbal and cognitive level. Such intervention should be aimed at all parents, and especially those having preschool age children.

Where home opportunities for the development and use of language are minimal, children may be expected to be lacking certain verbal skills which have proven so effective in predicting future educability. If school

is to be effective, then mediating, expressive and receptive language training should be a conscious part of curriculum organization. Additional training in language skills should be introduced at the earliest possible time in the school experience in order to arrest the accumulation of verbal deficit. The implementation of programs, such as that developed at George Peabody College (Smith & Mueller, 1969) for the improvement of verbal intelligence of culturally-disadvantaged children and that developed by Gahagan (1970) to offset difficulties experienced by children with restricted speech codes, would seem to be an urgent need, especially for groups of children who have little opportunity for the use and development of language within the home.

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TABLE 1

Data descriptive of the sample

	Mean	Range	S.D.
Low Verbal			
Progressive Matrices	109.96	93-127	9.59
WISC Verbal (average scaled score)	7.56	5.3-9.0	.98
High Verbal			
Progressive Matrices	109.72	92-127	9.50
WISC Verbal (average scaled score)	12.07	10.3-14.0	1.05

TABLE 2

Summary of means and standard deviations on environmental variables for low verbal and high verbal groups

Variables	Low Verbal N = 25		High Verbal N = 25		t	p
	Mean	S.D.	Mean	S.D.		
Interaction Index	118.8	21.9	127.8	11.9	1.93	<.05
Toys Index	12.9	3.6	14.7	2.5	1.93	<.05
Communication Index	79.9	14.4	83.8	8.5	1.12	>.10
Academic and vocational aspirations	3.6	.77	4.9	.76	6.19	<.001
Knowledge of child's academic development	4.7	.73	4.7	.74	0.08	>.10
Material opportunities for development of language	3.5	.70	4.6	.59	5.59	<.001